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(54) **Spoonable, soured non-dairy creams.**

(57) The invention concerns with soured, water-continuous non-dairy creams that contain 15-60 wt% of a fat and a protein component. These NDC's are stable and spoonable according to the definitions given herefore in the specification. Also a process for the preparation of these NDC's is part of the invention.

EP 0 540 085 A1

Spoonable creams are well known in Great Britain. Although the rheological parameters of creams and emulsions are defined in P.Sherman, Emulsion Science, Academic Press 1968, the term spoonable is not defined therein. According to our definition, a spoonable cream should display the following rheological behaviour at 5°C.

1) the yield value (also called: yield stress) should be more than 50 Pa extrapolated from shear rates between 100 – 300 S^{-1} (Bingham);

2) the Bingham viscosity should be less than 500 mPa s between shear rates of 100 – 300 S^{-1};

3) the failure to stress should occur at a strain of less than 0.5 Radians.

Yield values and Bingham viscosities were determined utilising the Carrimed Rheometer. Measurements were performed at 5°C, using a 4° cone and plate geometry. The shear stress was increased from zero at a rate of 60 Pa/min, and shear rates were measured until values in excess of 600 s^{-1} were achieved. The experiment was then terminated. A graph of shear stress vs shear rate was plotted, and a straight line fitted to the curve between the shear rates of 100 – 300s^{-1}. The slope of this line was the Bingham viscosity. The yield stress was determined by extrapolation of this line back to zero shear rate.

The failure to stress measurements were determined utilising the Carrimed Rheometer. Measurements were performed at 5°C, using a 4° cone and plate geometry. The experiments performed were torque sweeps in oscillation mode. The samples were oscillated at a frequency of 1Hz, as the torque was increased from 50 – 5000 μNm in thirty steps. The measurement time at each torque value was 10 sec, and the time between measurements was 5 sec. The parameters measured were storage modulus (G^I), loss modulus (G^{II}) and strain (in radians). A graph of G^I and G^{II} vs strain was then plotted. At low strain values the samples displayed solid – like characteristics, and $G^I > G^{II}$. At higher strain values $G^{II} > G^I$ and the failure to stress was defined as the strain at which $G^I = G^{II}$.

Although spoonable dairy creams are known that meet these requirements very well, the stability of dairy creams is still a problem when using longer storage times. It is also for the purpose of obtaining healthier products, i.e. products containing more unsaturated or at least fewer saturated fatty acid moieties, that attempts have been made to produce a non – dairy equivalent of a soured, spoonable dairy cream. However, so far any efforts to produce a soured, spoonable non – dairy cream, thus one containing non – dairy fats, in particular vegetable fats, have been unsuccessful : Either the stability or the rheology of the creams was insufficient.

Examples of soured, non – dairy creams are disclosed in e.g. US 3,433,643, according to which soured creams are made by a process, wherein calcium carbonate and a buffer are incorporated in the product. However, application of this process cannot, at least not without great difficulties, lead to soured creams with the desired rheology of a spoonable cream. Moreover, these creams require the presence of $CaCO_3$.

According to US 4,119,608 imitation creams are known that comprise large amounts of partial glycerides, whereas only small amounts of triglycerides are present. Imitation sour creams, made by chemical acidification are known from US: Re 27,381. Such creams, however, are difficult or even impossible to heat. After heating the resulting product will not display our characteristics for a spoonable cream.

Therefore, so far no non – dairy equivalent of a soured, spoonable dairy cream which is free from calcium carbonate and/or emulsifiers, was available.

We have now found a solution to the problems mentioned above. Therefore, our invention is concerned in the first place with soured, water – continuous, non – dairy creams (NDC's) free from calcium carbonate and/or emulsifiers, comprising 20 – 60 wt.% of a triglyceride fat, and a protein component, which soured NDC's are stable and spoonable. In this respect, the term stable is defined as : the cream can be stored for at least 14 days at a temperature of 0 – 15°C, such that the rheology remains within our definition of spoonable, no serum leakage occurs, and the cream remains microbiologically stable.

We have defined the term spoonable above, based on standard rheological tests. Such tests have been discussed by Sherman.

The pH of our soured, spoonable NDC's is in general 4.0 – 4.8, preferably 4.4 – 4.6.

Although the fat level of our new compositions can range from 15 – 60 wt.%, it is preferred to use fat levels of 25 – 45 wt.%.

The fats that can be used in our NDC's are well – known vegetable fats. Preferred fats, however, are : palmkernel oil, soybean oil, rapeseed oil, coconut oil, sunflower oil, safflower oil, butterfat or fully or partially hardened fractions thereof. It should be noted here that butterfat is only applied in a mixture with a vegetable fat.

It is also possible to use indigestible "fats", such as the well – known sucrose poly fatty acid esters (SPE's) as "fat" component in our new non – dairy creams.

If butterfat is used, it can be present in amounts up to 40 wt.%, preferably 10 – 30 wt.%, of the fat phase.

Although the highest data for yield stress are obtained when firm (i.e. hardened) fat blends are used, it is possible to use fat compositions that are completely liquid. As these liquid fats are normally highest in unsaturated fatty acids, these compositions will be the healthiest.

In order to obtain good taste, the correct acidity level, but also good rheological properties, it is essential that a protein component be present in our compositions. Very suitable milk protein components are buttermilk powder (B.M.P) and skimmed milk powder (S.M.P). It is of course also possible to add flavours to our NDC's.

The amounts of B.M.P and/or S.M.P are suitably between 1.0 – 15.0 wt.% (calculated on total NDC), preferably between 4.0 and 12.0 wt.%.

Another important factor for the rheological and organoleptic properties of our NDC's is the droplet size of the fat droplets in our emulsions. The droplet size should preferably not be greater than 5.0 μm, more preferably less than 2.0 μm.

The invention is further concerned with a process for the preparation of a soured NDC. This process comprises at least the steps of :

- making a pre – mix of vegetable fat(s), protein component(s), in particular B.M.P and/or S.M.P, water and flavours;
- heating the pre – mix to 40 – 90 °C;
- homogenizing the pre – mix in at least a single stage homogenizer under pressure;
- cooling the homogenized pre – mix to a temperature of 2 – 30 °C;
- adding to the pre – mix a culture medium capable of converting lactose into lactic acid by fermentation;
- fermenting the pre – mix until a pH = 4.0 – 4.6;
- storing the fermented pre – mix at a temperature of less than 15 °C, preferably 0 – 10 °C.

In the above – mentioned process the homogenization pressure is preferably in the range of 10 – 250 bar. If the pressure is above 100 bar, then normally a second stage homogenization of 20 – 100 bar is required.

This process is applied for the preparation of the soured, spoonable NDC's as disclosed above.

EXAMPLE I

A premix was made of the following components

	wt%
Fat (Fruit D'or Margarine blend)	30
BMP	9
Water	61

This premix was heated to 60 °C, homogenised at 10 bar, and cooled to 5 °C, whereupon 1% of a culture medium was added. The cream was kept at 20 °C for 24 hours and stored at 5 – 10 °C. The rheological data were as follows:

Extrapolated yield stress	255 Pa
Bingham viscosity	22 mPas
Failure to stress	0.011 radians

EXAMPLE II

Example I was repeated except that sunflower oil was used as the fat phase.
The rheological data were as follows.

Extrapolated yield stress	74 Pa
Bingham viscosity	145 mPas
Failure to stress	0.047 radians

Claims

1. A soured, water-continuous non-dairy cream (NDC), free from calcium carbonate and/or emulsifiers, comprising 15-60 wt.% of a triglyceride fat and a protein component characterized in that the soured NDC is stable and spoonable and displays the following characteristics :
   a) a yield value of more than 50 Pa extrapolated from shear rates between 100-300 S^{-1} (Bingham);
   b) a Bingham viscosity of less than 500 mPa s between shear rates of 100-300 S^{-1};
   c) failure to stress at a strain of less than 0.5 Radians.

2. A soured NDC according to Claim 1, wherein the pH of the NDC is 4.0-4.8.

3. A soured NDC according to Claims 1-2, wherein the fat level is 25-45 wt.%.

4. A soured NDC according to Claims 1-3, wherein the fat is at least one of the group consisting of palmkernel oil, soybean oil, rapeseed oil, coconut oil, sunflower oil, safflower oil, butterfat, sucrose, poly fatty acid esters, or fully or partially hardened fractions thereof, with the prerequisite that butterfat is always mixed with a vegetable fat.

5. A soured NDC according to Claim 4, wherein the butterfat is present in amounts of 0-40 wt.% of the total fat phase.

6. A soured NDC according to Claim 1, wherein the fat is a fully liquid oil or a blend of liquid oils.

7. A soured NDC according to Claims 1-6, wherein the NDC contains 1.0-15.0 wt.% of buttermilk powder and/or skimmed milk powder as protein component.

8. A soured NDC according to Claim 7, wherein the level of buttermilk powder and/or skimmed milk powder is 4.0-12.0 wt.%.

9. A soured NDC according to Claims 1-8, wherein the droplet size of the fat droplets is less than 5.0 µm, preferably less than 2.0 µm.

10. A process for the preparation of a soured NDC comprising the steps of :
    - making a pre-mix of vegetable fat(s), protein component(s) and water;
    - heating the pre-mix to 40-90°C;
    - homogenizing the pre-mix in at least a single stage under pressure;
    - cooling the homogenized pre-mix to a temperature of 2-30°C;
    - adding to the pre-mix a culture medium capable of converting lactose into lactic acid by fermentation;
    - fermenting the pre-mix until a pH = 4.0-4.6;
    - storing the fermented pre-mix at a temperature of less than 15°C, preferably 0-10°C.

11. A process according to Claim 10, wherein a two-stage homogenization procedure is used, applying a pressure of 100-250 bar in the first stage and 20-100 bar in the second stage.

12. A process according to Claims 10-11, wherein the process is applied for the preparation of stable, spoonable, soured NDC's with the composition of Claims 1-9.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 20 3193

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	US-A-4 199 608 (CECILIA GILMORE ET AL.)		A23L1/19
D,A	US-A-3 433 643 (CHARLES W. TATTER ET AL.)		
D,A	US-E-27 381 (LAWRENCE LEWIS LITTLE)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A23L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	19 JANUARY 1993	ALVAREZ ALVAREZ C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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